Fizika müəllimliyinə namizədin qazandığı elmi bilik və bacarıqları tədris prosesində tətbiq etməsi

Dwi Agus Kurniawan[1], **Dr. Darmaji**[2], **Astalini**[3], **Peni Sefiah I.**[4]

Müəlliflər:

[1] Dwi Agus Kurniawan — Pedaqogika üzrə fəlsəfə doktoru, Riyaziyyat və Təbiət Elmləri Bölümü, Jambi Universiteti, İndoneziya. E-mail: dwiagus.k@unja.ac.id

[2] Darmaji — Dr. Riyaziyyat və Təbiət Elmləri Bölümü müəllimi, pedaqogika və elmlər fakültəsi, Jambi Universiteti, İndoneziya.

[3] Astalini — Jambi Universitetinin müəllimi, İndoneziya.

[4] Peni Sefiah I. — Jambi Universiteti bakalavr tələbəsi, İndoneziya.

Annotasiya. Elmi bilik və bacarıqlar mahiyyət etibarilə tədris müddətində tələbənin qazandığı əsas və inteqrativ bacarıqlardan ibarətdir. Əsas bacarıqlar tədris müddətində inteqrasiya olunmuş bacarıqların əsasını təşkil etdiyi halda, inteqrasiya edilmiş bacarıqlar praktikada əxz olunur. Bu tədqiqatın məqsədi inteqrasiya olunmuş elmi biliklərin nümunəsində fizika təhsili alan tələbənin bacarıqlarını ortaya çıxarmaqdır (məlumatların cədvəlini hazırlamaq, verilənlər arasındakı əlaqəni müəyyənləşdirmək, məlumat və proses məlumatlarının əlçatanlığını müəyyən etmək). Bu işi *mütəmadi təsvir (Sequential Descriptive)* modelindən istifadə edərək qarışıq metodu əsasında reallaşdırmaq mümkündür. Nümunə olaraq əsas texniki üsul məqsədli nümunələrdən istifadə etmək texnikasıdır. Onlar istifadə edilən məlumatların toplanması vasitələri, müşahidə sənədləri, müsahibələr və sənədlərdir. Tədqiqat nəticəsində müəyyən olunmuşdur ki, fizika təhsili alan gələcək müəllimlərin tədris qabiliyyəti, inteqrasiya olunmuş elmi bilik və bacarıqlarının praktikada tətbiq edilməməsi və laboratoriya materiallarının tam dərk edilməməsi səbəbindən qənaətbəxş səviyyədə deyil.

Açar sözlər: Elmi-təcrübi sınaq, akademik tədris ilində qazanılan bacarıqlar, fizika müəllimi.

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Description of Science Process Skills for Physics Teacher's Candidate

Dwi Agus Kurniawan[1], **Dr. Darmaji**[2], **Astalini**[3], **Peni Sefiah I.**[4]

Authors:

[1] Dwi Agus Kurniawan, Phd., Department of Mathematics and Natural Sciences Education, University of Jambi, Indonesia. E-mail: dwiagus.k@unja.ac.id

[2] Darmaji, Dr., lecturer at University of Jambi, Faculty of Teacher Training and Science, Department of Mathematics and Natural Sciences Education, Indonesia.

[3] Astalini, Lecturer at University of Jambi, Indonesia.

[4] Peni Sefiah I., Student of University of Jambi, Indonesia.

Abstract. Science process skill consists of basic and integrated process skills. Basic skills are the basis for integrated process skills. Integrated process skills can be seen in practicum activities. The purpose of this research is to know the skill of integrated science process (make the data table, describe the relationship between variables and obtain and process data) Physics education student. This research used a mixed method using Sequential Explanatory model. Sampling technique used is Purposive Sampling. The instruments of data collection used are observation sheet, interview, and documentation. The result of research stated that the integrated science process skill of physics education student as a whole is not good because of lack of experience in doing practicum and their understanding of lab materials.

Keyword: Guide practical, Science Process Skill, Physics Teacher

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İntroduction

Champagne and Klopfer (1981) in Behera (2014) "used the term 'process skills' to refer to the processing strategies that a person brings to bear in solving a problem." Sartika (2015) "SPS is a scientific method in which trained steps to find something through experiments." Rezba, et al (2003) "they are the things that scientists do when they study and investigate." Scientific process skills are scientific strategies undertaken to solve problems through scientific activities.

Scientific process skills are grouped into two, namely basic and integrated science process skills. In this article only discuss integrated process skills. Chabelengula (2012) "integrated process skills include controlling variables, defining operationally, formulating models, interpreting data and experimenting formulating hypotheses and describing relationships between variables." Rezba, et al (2003) "the integrated skills are not separate and distinct from the basic skills. The basic skills provide the foundation for the more complex integrated skills." Karamustafaoglu (2011) "the integrated process skills are the terminal skills for doing an experiments or solving the problems." Then it means integrated science process skills are very important skills to be improved so that students have the ability to solve problems well and able to interact well with each other.

Process skills of collecting and processing data are a skill to obtain information or data from the literature or observation. Rezba (2003) "students will carry out several investigations and produced their own data tables." Creating a table is done after the data collection is complete. This is necessary so that students are able to present the necessary data in the research. Rezba, et al (2003), One skill need to conduct an investigation is the organization of data in tables. From the existing data, students are required to describe the relationship between the variables of the data table that has been made a graph. Rezba, et al (2003), One each other skills associated with the grapping needs of the skill of interpreting a graph. Integrated science process skills are very important and interrelated.

According to the Malaysian Standard Curriculum for Primary School (2013) in Rauf, et.al (2013), integrated science process skills are required for solving the problems, seeking answers or making systematic decisions. It is a mental process that will encourages critical and creative thinking, then analytic and systematic thinking. Mastering at science process skills with a better understanding and appropriate attitude towards science would ensure the students think effectively. Farsakoglu (2014) "integrated Science Process Skill involves creative and critical thinking alongside scientific thinking." Ting (2014) "with the variety of teaching and learning methods in the classroom, it is anticipated that pupils' interest in science will be enhanced." Science lessons that are not motivated will affect their scientific thinking skills and curiosity. By applying integrated process skills students become more curious to find scientific concepts, thereby increasing their ability to think critically.

Lavinghousez (1973) in Burak, et al (2012) that "the way to measure the SPS of students is from their laboratory reports, oral presentations, and observation." Buyuktaskapu, et al (2012) said that In this study point out that Processing Skills necessary for children to do scientific research can be developed. Skills of students' science processes can be seen from practicum activities because in practicum activities involve students in the use of laboratory tools that are used to discover the concept of physics both individuals and groups.

The result of lecturer's evaluation stated that there are still many obstacles faced by students in the process of practicum implementation. The research by Kuswanto (2017), students' science process skills in the lab is still very low. With such circumstances, it means that the students have not been able to independently perform their practical ac-

tivities and have little initiative in solving their lab problems.

Norma (2017) "based on the KPS of students who are highly unskilled, the factors that affect the student's KPS, the initial experience of students before the basic physics lab is still small, the students' knowledge about the concept in the practicum material, the availability of practicum tools and the practicum guidance that is not train SPS." Santiani (2011) "a practicum guide as one of the learning resources in practicum activities should be a guide for students in developing science process skills." Meerah (2002) "what is crucial is the quality of the experiences that students have there." In a similar vein, the finding of research on the understanding of the science inquiry is as negative as those for conceptual understanding. Students should have practicum experience from teachers while students are still studying in high school because of the ability of teachers in teaching the material to be a student's stock when a student at the university.

The survey results from DebBurman (2002) "quantitatively support the pedagogy's success by reporting consistently positive student attitudes toward their learning." Students perceived substantial improvements in several sciens process skills. Leonor (2014) "due to the fact that every new concept, understanding, and phenomena in science require a new approach or a re-evaluation of the old approach, all for the purpose of passing to the learner the scientific knowledge and process skills." Integrated science process skills have an effect on pedagogical ability, if the science process skill is good then the pedagogic ability is also good.

Methods

The research method used is a mixed method using Sequential Explanatory model. Creswell (2014), an Explanatory sequential mixed method is one in which the researcher first conduct quantitative research analyzes the result and then builds on the results to explain them in more detail with qualitative research.

The subject of this research is a student of Study Program of University. The sample in this research was taken using purposive sampling technique with the number of samples obtained by 30 students. The data obtained in this study are qualitative data and quantitative data. Qualitative data was obtained through observation using observation sheet while quantitative data was obtained through interview using interview sheet. To strengthen the data result also conducted documentation study on the final report of student practicum.

Data analysis technique used is quantitative data analysis first, then analyzed qualitative data to compare the result of quantitative data. Analysis of the observed data obtained is done gradually. Observations were conducted in a non-participatory way, meaning that the researcher did observations outside the observed group (Bundu, 2006). Skill scoring used is a four scale, from a Likert scale. Selection of four scales is intended to adjust the criteria desired by the researcher that is; 1) Very bad; 2) Not Good; 3) Good; 4) Very Good. These four criteria are supplemented by rubric.

Results

Measurement of students' science process skill is done when students perform Basic Physics I practice on measurement, friction, equilibrium, density, and viscosity. integrated science process skills Here are the results of students' integrated process skill observation on each practical material (creating a data table, describing relationships between variables and obtaining and processing data):

1. Measurement

In the measurement material, there are 3 practicum activities performed, namely the measurement of the steering wheel, screw micrometer and spherometer. Here are the results of the students' process skills when doing the measurement practice:

Table 1. **Description of SPS observation sheet on Steering Wheel Material**

No	SPS Classification	Number of Students			
		Very Bad	Bad	Good	Very Good
1	Collect and organize data	12	8	4	6
2	Create a data table	7	13	7	3
3	Describe the relationship between variables	8	17	5	0

Figure 1. **The SPS chart collects and processes the term data material**

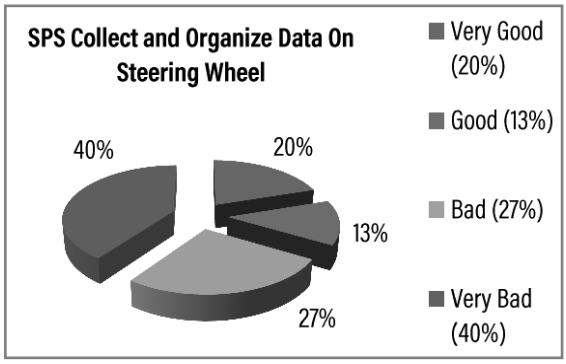
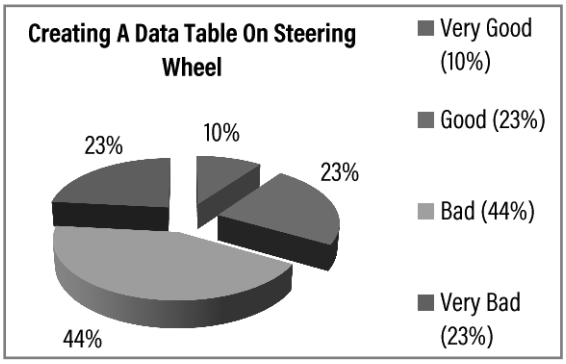


Figure 2. **The SPS chart creates a table of Steering Wheel materials**

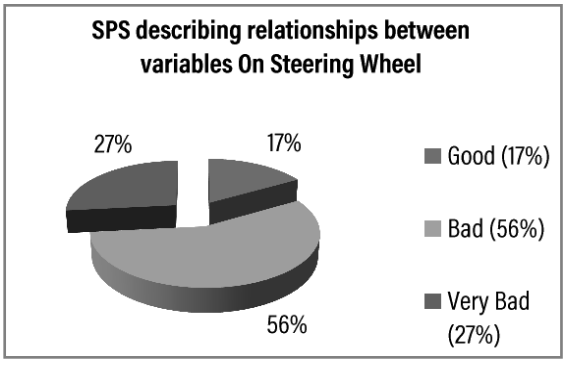


a. Steering wheel.

Figure 1 explains that students who possessed the science-process skills to collect and process very good, good, bad and very bad sequential data are 20%, 13%, 27% and 40%, respectively. From the data, it is known that the students' science process skill which is included in the category is good because the students have experience in conducting the term laboratory. While students who have the skills of the process of science is not good because the students have no experience in collecting and processing data on the measurement of the steering wheel.

Figure 2 shows that students' science process skills in making the tables are variate. Figure 2 shows that students who have science-process skills create a table are very good, good, bad and very bad are 15%, 22%, 41% and 22% respectively. From the data can be seen that many students who have the

Figure 3. **The SPS chart illustrates the relationship between variable On Steering Wheel material**



skills of the science process are not good. This is because the students have never practiced the previous slide.

Figure 3 shows that the students' science process skills in describing the relationships

Table 2. **Description of SPS observation sheet on Micrometer Screw Material**

No	SPS Classification	Number of Students			
		Very Bad	Bad	Good	Very Good
1	Collect and organize data	9	11	7	3
2	Create a data table	6	14	5	5
3	Describe the relationship between variables	21	7	2	0

Figure 4. **The SPS chart collects and processes the data On micrometer screw material**

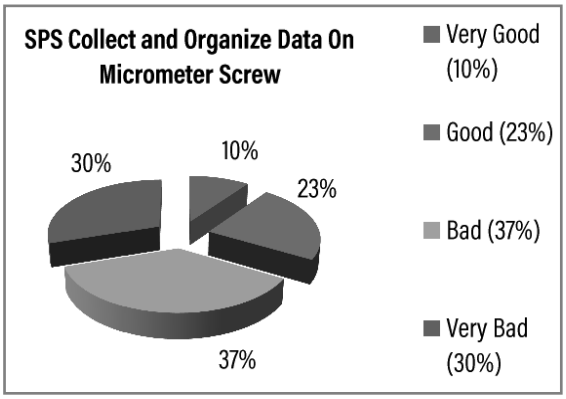
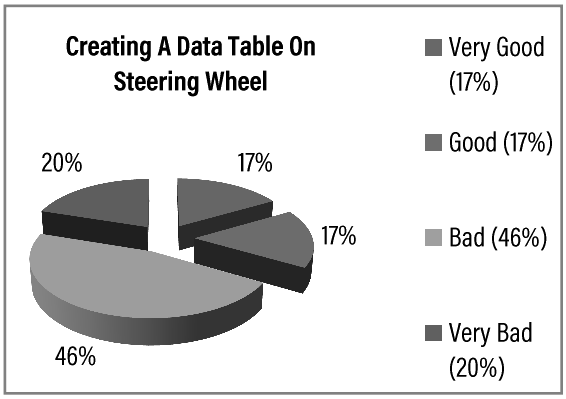


Figure 5. **The SPS chart create a table on micrometer screw material**



among variables varied, which were very good, good, bad and very bad at 0%, 17%, 56% and 27% respectively. From the data can be seen that most students have the skills of the science process describes the relationship between the variables is not good. That's because students do not understand the meaning of the variable itself.

b. Micrometer Screw.

Figure 4 shows that the students' science process skills in collecting and processing data varied, which are very good, good, bad, and badly sequential at 18%, 21%, 34% and 27% respectively. From the data can be seen that the dominant students have the skills of the process of collecting and processing data is not good. That's because students have no experience in practicum micrometer screw before.

Figure 5 shows that the students' science process skills in making the tables varied, which were very good, good, bad and very bad at 17%, 17%, 46% and 20% respectively. From the data, it can be seen that most students have bad science process skills to create a table. The interview result obtained that because students have never practiced micrometer screw, so the student has not been able to create data table well.

Figure 6 shows that students' science process skills in describing the relationships among variables varied, is good, bad and very bad, respectively 7%, 23%, and 70%. The data shows that most students have the skills of the scientific process to describe the relationship between variables is very bad. The result of the interview stated that the reason is that the students have never practiced micrometer screw. In addition, students also do not understand the meaning of the variables in an experiment.

Table 3. **Description of SPS observation sheet on Spherometer Material**

No	SPS Classification	Number of Students			
		Very Bad	Bad	Good	Very Good
1	Collect and organize data	4	6	12	8
2	Create a data table	6	4	13	7
3	Describe the relationship between variables	25	3	2	0

Figure 6. **The SPS Chart describing relationship between variables on micrometer screw material**

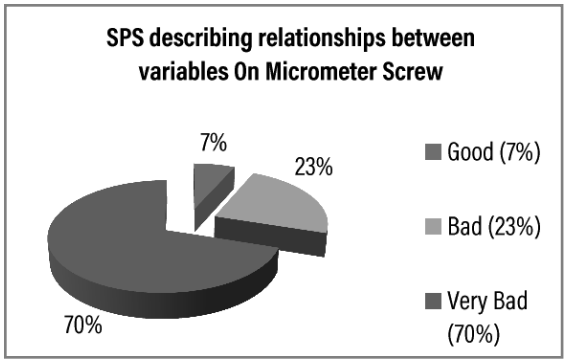
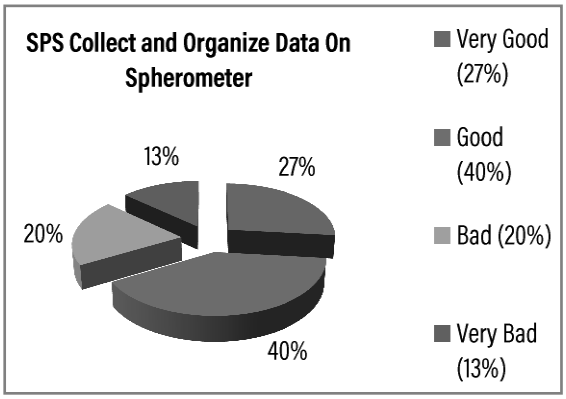


Figure 7. **The SPS chart collects and processes the Spherometer material data**



c. Spherometer.

Figure 7 shows that students' science process skills in collecting and processing data varies, which are very good, good, bad, and very bad sequential at 27%, 40%, 20% and 13%, respectively. From the data can be seen that the student process skills are predominantly good. Students are able to collect and process data on spherometer material because the students have experience in conducting the previous measurement practice. In addition, students are also looking for literature as a reference in doing practicum spherometer.

Figure 8 shows that the students' sciences process skill in making the tables varies, which is very good, good, not good and very bad in the sequence is 23%, 44%, 13 and 20%. The data shows that most students have good science-process skills in creating tables. This is because the students have had experience in conducting the previous measurement practice. In addition, students are also looking for literature as an inner reference do practicum spherometer.

Figure 8. **The SPS chart creates the data table On Spherometer material**

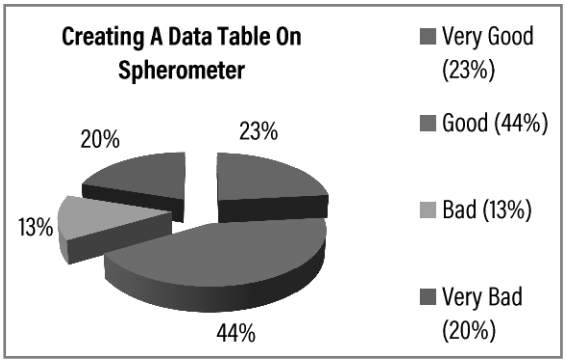


Table 4. **Description of SPS observation sheet on Friction Material**

No	SPS Classification	Number of Students			
		Very Bad	Bad	Good	Very Good
1	Collect and organize data	6	10	7	7
2	Create a data table	4	6	11	9
3	Describe the relationship between variables	6	9	8	7

Figure 9. **The SPS chart illustrates the relationship between variables on Spherometer material**

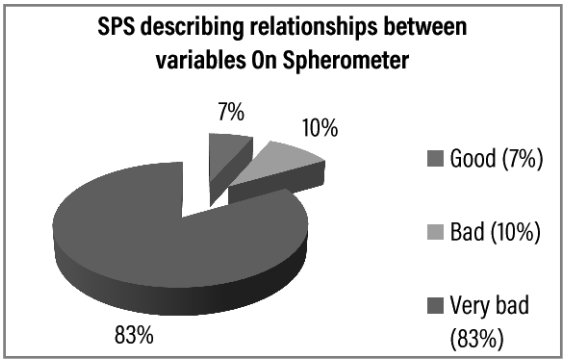


Figure 10. **The SPS chart collects and processes on Friction material**

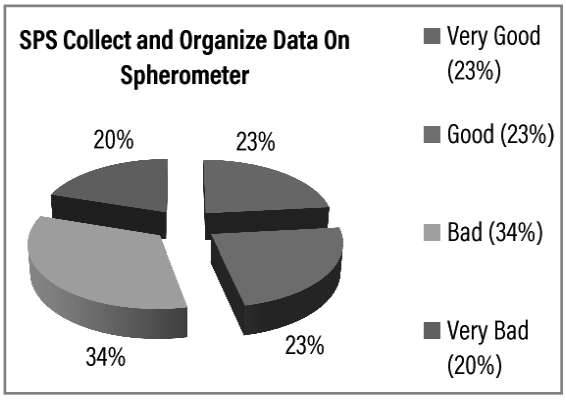


Figure 11. **The SPS chart creates a table data On Friction material**

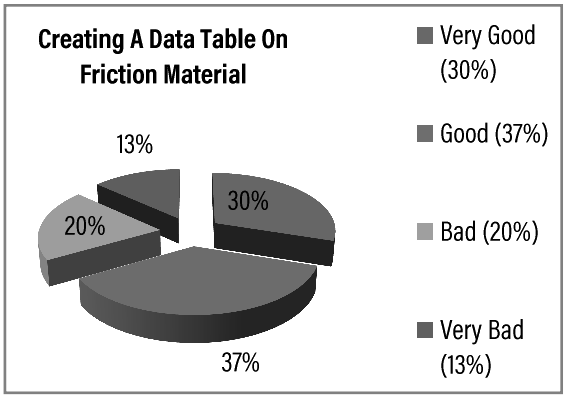


Figure 9 shows that students' science process skills in describing the relationship between variables, that is good, bad and very bad are 7%, 10%, and 83% respectively. From the data can be seen that the skills process of the students in describing relationships between variables is not good. That's because students do not understand the meaning of the variables in an experiment.

2. Friction

Figure 10 shows that the science process skills of students in collecting and processing data vary, very good, good, good and very good are respectively 23%, 23%, 34% and 20%. The data shows that some students have good science process skills and are not good. Some students are able to collect and process data and some are unable to do so. The difference is influenced by the ability of students to understand the friction material.

Figure 11 shows that the science process skills of students in making tables varied, which is very good, good, bad and very bad are respectively 30%, 37%, 20% and 13%.

Table 5. **Description of the SPS observation sheet on the Equilibrium material**

No	SPS Classification	Number of Students			
		Very Bad	Bad	Good	Very Good
1	Collect and organize data	1	10	6	3
2	Create a data table	5	7	13	5
3	Describe the relationship between variables	17	8	5	0

Figure 12. **The SPS Chart illustrates the relationship between variables On Friction material**

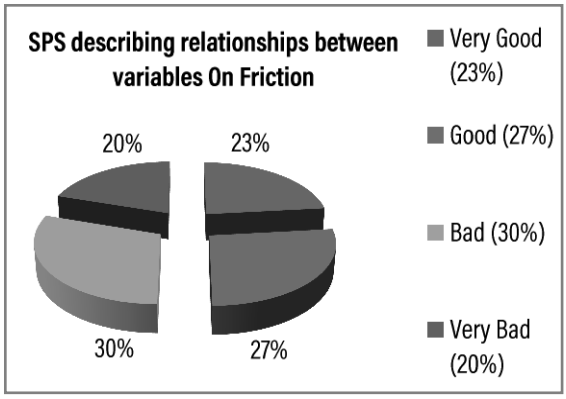
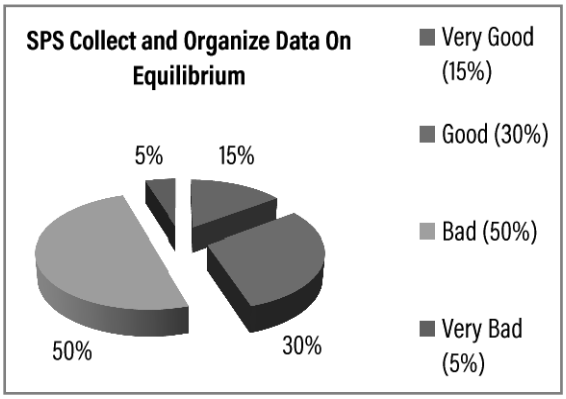


Figure 13. **The SPS chart collects and processes material data of Equilibrium**



The data shows that most students have the skill of the scientific process of making a good table. Based on the experiments conducted the students were able to enter the data obtained in the experimental table.

Figure 12 shows that the results of science process skills of students in describing the relationship between variables are very good, good, bad and very bad are respectively 23%, 27%, 30% and 20%. From the data can be seen that some students have good science process skills and some have bad science process skills. From the data obtained that students who have good science process skills because students are able to the relationship between variables. While students who have science process skill that is not good are students who are unable to describe the relationship between variables due to lack of understanding of the variables. The difference is influenced by the ability of students to understand the friction material.

3. Equilibrium

Figure 13 shows that the science process skills of students in collecting and processing data vary, namely very good, good, bad and very bad in the sequence is 15%, 30%, 50% and 5%. From the data can be seen that the students' science process skills are not good. This is because students do not have experience in the equilibrium practicum in high school.

Figure 14 shows that the science process skills of students in making tables varied, which is very good, good, good and very good are respectively 17%, 43%, 23% and 17%. From these data can be seen that students' science process skills in creating tables are good. But there are some students who can not create a table of experimental results because they have no previous experience.

Table 6. **Description of SPS observation sheet on Density materials**

No	SPS Classification	Number of Students			
		Very Bad	Bad	Good	Very Good
1	Collect and organize data	7	12	8	3
2	Create a data table	2	5	13	10
3	Describe the relationship between variables	6	14	7	3

Figure 14. **The SPS chart creates table of Equilibrium material**

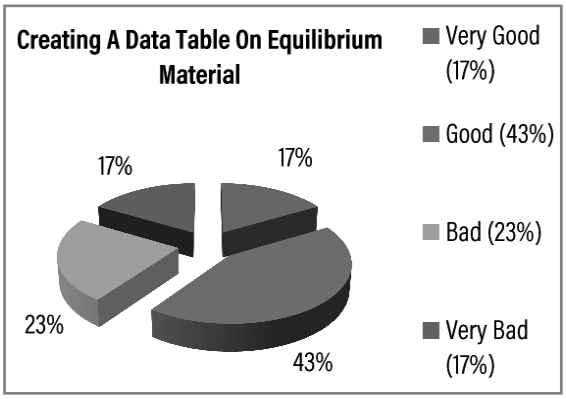


Figure 15. **The SPS chart illustrates the relationship between variables of Equilibrium material**

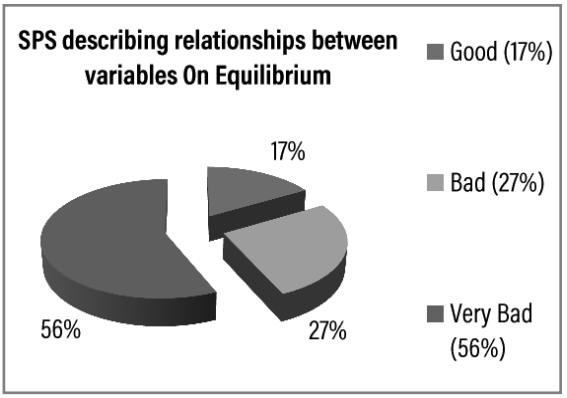


Figure 15 shows that the science process skills of students in describing the relationship between variables are varied, that is good, is not good and is not very good are respectively 17%, 27%, and 56%. From the data can be seen that most students have very bad process skills in describing the relationship between variables. That's because they do not understand the meaning of variables. This is reinforced by the absence of students who have very good skills.

4. Density

Figure 16 shows that the science process skills of students in collecting and processing data vary, that is very good, good, bad and very bad in the sequence were 10%, 27%, 40% and 23%. From the data shows that most of the students have bad science process skills. The result of the interviews confirmed that it happened because the students had never practiced the previous density, so the science process skills they had were not good.

Figure 16. **The SPS chart collects and processes the data On Density material**

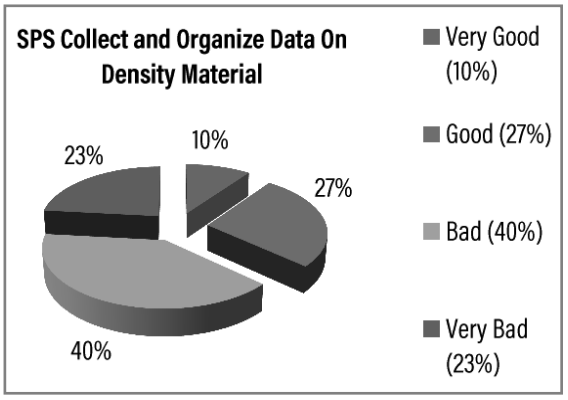


Table 7. **Description of SPS observation sheet on Viscosity material**

No	SPS Classification	Number of Students			
		Very Bad	Bad	Good	Very Good
1	Collect and organize data	9	10	6	5
2	Create a data table	4	8	13	5
3	Describe the relationship between variables	14	8	5	3

Figure 17. **Chart creates a table On Density material**

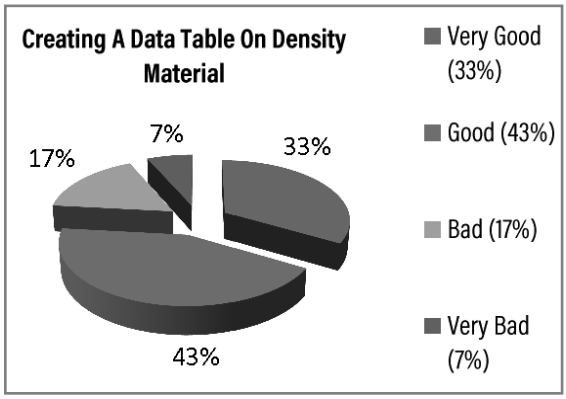


Figure 18. **The SPS Chart illustrates the relationship between variables on density material**

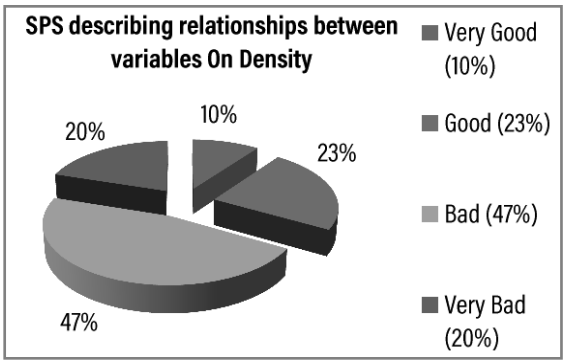


Figure 19. **SPS chart collects and processes data On Viscosity material**

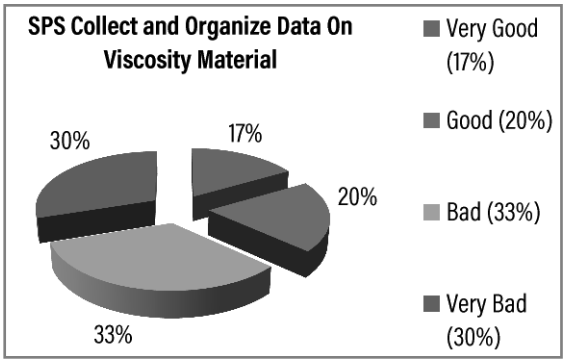


Figure 17 shows that the science process skills of students in making tables varied, which is very good, good, bad and very bad in the sequence are at 7%, 33%, 43% and 17%. Most students have very bad science-process skills in creating data tables. Students have never practiced density before so that students do not understand the data that should be included in the table.

Figure 18 shows that the science process skills of students in describing the relationship between variables are varied, that is very good, good, bad and very bad in the sequence were 10%, 23%, 47% and 20%. Scientific process skills in describing the relationship between variables are all bad. The cause is the same as in previous practice, that is less understanding of the variables and lack of experience in conducting density practice.

5. Viscosity

Figure 19 shows that the science process skills of students in collect and process data vary, that is very good, good, good and very good are respectively 17%, 20%, 33% and 30%. The science process skills of collecting

Figure 20. **SPS Chart creating table On Viscosity Material**

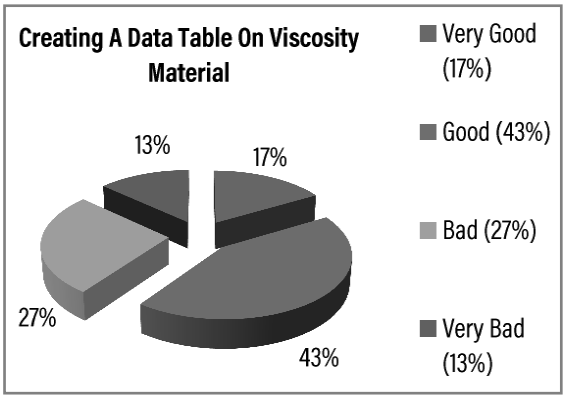
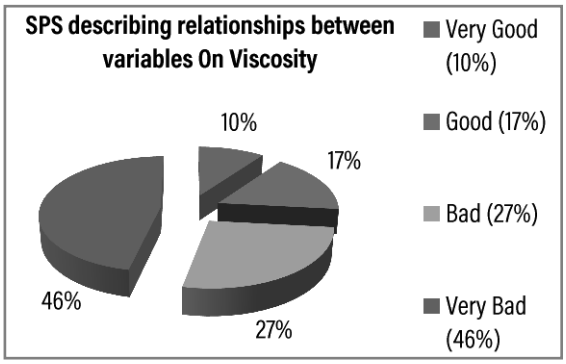


Figure 21. **The SPS chart illustrates the relationship between the variables of the Viscosity material**



and processing data indicate that it is still not good. Students have no experience in practicum viscosity.

Figure 20 shows that the students' science process skills in making the tables varied, are very good, good, bad and very bad in the sequence were 17%, 43%, 27% and 1 % respectively. From the data can be seen that some students have the skills to make a good table. Students are able to organize the data obtained in the form of experimental tables.

Figure 21 shows that the science process skills of students in describing the relationship between variables are varied, that is very good, good, bad and very bad in the sequence were 10%, 17%, 27% and 46%. As in previous practice, the science process skills describe the relationship between variables is very bad. Students have no experience in doing practicum viscosity. In addition, students also do not understand the variables that exist in the practice of viscosity.

Discussion

Science Process skills are very important thing in science learning. At research based science labs, the development of science process skills enables students to solve the problems, critical, deciding and finding the answers to their curiosity, rather than having the student just to memorize the concepts (Rehorek, 2004; Germann & Aram, 1996b) in Karamustafaoglu (2011). Science process skills construct the framework of research-based lab applications. With the research-based lab activities, students are able to learn meaningfully, use science process skills and familiarize with the process of how they construct the information they got from the science lessons. Means in applying the science process skills required the pedagogic ability of a teacher or lecturer.

There are many benefits from a practical work. Practical work can turns abstract concepts into concrete experiences. It is appropriate to conceive of teaching as not only giving guidance and providing counselling but also as skillfully constructing situations in which students may engage in guided study with a view to achieving intended learning outcomes. Meerah (2015) "The practical work is important thing in the teaching of science. Through laboratory work or doing experiments or projects, students will develop their process skills, problem-solving skills, manipulative skills as well as scientific attitudes, besides understanding the inquiry process and the nature of science."

The results showed that students' science process skills varied. Science process Skills students' are very bad because students do

not have experience in practicum. This is evidenced by a student interview result that says:

Q: Have you ever practiced measuring, friction, equilibrium, density, and viscosity?

A: No. while in school I have never practiced measuring, friction, equilibrium, density, and viscosity.

Thiel (1976) From a theoretical viewpoint, experience should play a role in the development of any skill. Piaget (1965) in Thiel (1976) claims that in all development, experience and maturation are necessary components. Bartlett (1958) Thiel (1976) views thinking as a high-level skill whose higher level forms must be acquired by practice. Molitor (1971), Reed (1968), and Tannenbaum (1971) Thiel (1976) support this notion that increases in skill performance must be acquired by experience with the skill. The student's experience in practicum affects his science process skills. Inexperienced students have poor science process skills in the lab.

In addition, students' understanding of practicum materials also affects the skills of the scientific process they have. Students less understanding of the meaning of the variable, so that students are less able in describing the relationship between variables. The student interview result says:

Q: What do you think about variables?

A: I do not know what a variable is.

Q: So how can you describe the relationship between variables?

A: I Do not know. If it's a variable I do not know how I can describe the relationship between them.

From the interview result, it can be seen that the students' knowledge about the variable is still very less. Students do not understand the purpose of the variables in the lab so that students are not able to describe the relationship between variables in the lab. Oktadivani (2017) "students' science process skills in describing the relationship between variables is still low despite applying the instructional model recommended in the curriculum 2013." This is because when high school students are too often guided teachers in doing practical activities, the lack of variations of models and methods and media learning used in the learning process.

Vygotsky in Hlaing and Htay (2016) "saw cognitive growth as a collaborative process. Children, said Vygotsky, learn through social interaction". Thus, to develop more systematic, logical, and rational concepts, adults must help direct and organize a child's learning before the child can master and internalize it. Amansoi (2017) "give recommendation to proper training and re-training of science teachers should be made to ensure that they are qualified and equipped with pedagogical skills and impact same to students, the government/proprietors of schools should give priority to equipping the science laboratories and improving the teaching and learning environment, practical work should be emphasized for the proper acquisition of science process skills." The science process skill is influenced by the students 'knowledge of the material being studied, so that early knowledge is needed to improve students' science process skills.

Conclusions

Based on the results of research conducted, it can be concluded that the skills of the process of science are very important. Scientific process skills can be seen when practicum implementation. Scientific process skills are influenced by experience, the ability to understand the material and the quality of the teacher in delivering the material. Overall science process skills of university's students is still considered not good.

Suggestions

In order to improve students' science process skills, it is necessary to conduct similar research that can improve the scientific process of physical education students.

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